NGQuark

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User Guide

PROMAX Motion & Control

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Rev. 3.00.3

1 Features

The system NGQUARK is a numerical control based on the Freescale MCF5213 ColdFire microprocessor. NGQUARK born as a stand alone and can also be used as SLAVE CANOPEN with appropriate firmware.

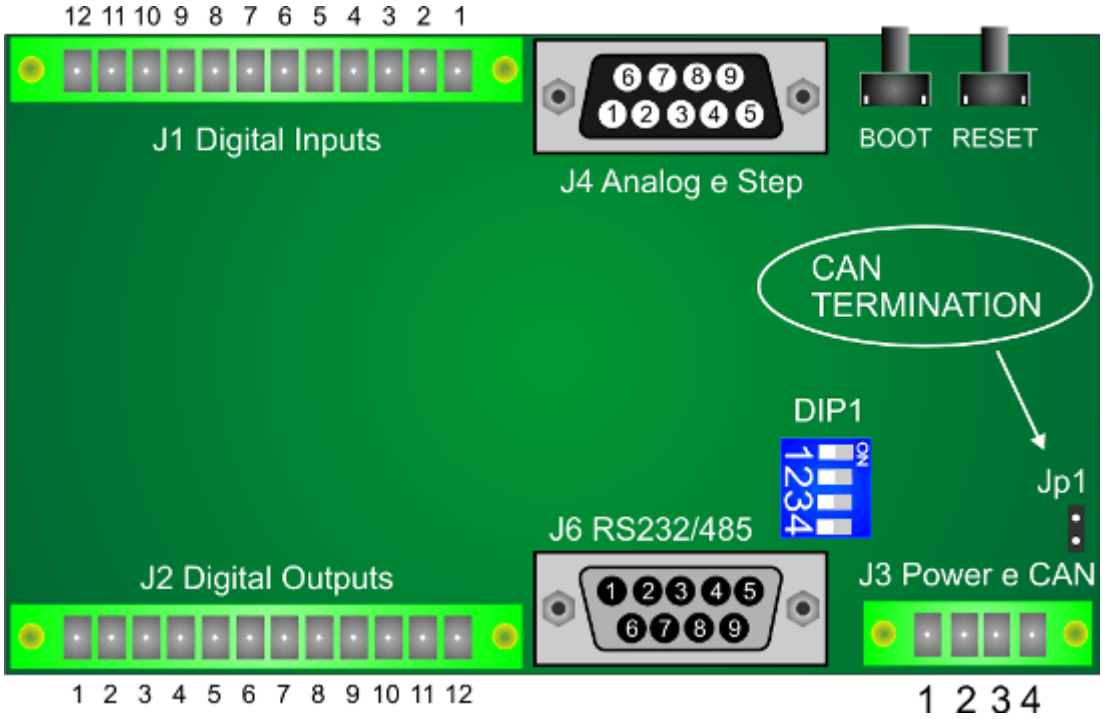
NGQuark

- ***Microprocessor MCF 51JM128 at 48MHz***
- ***128 KbFlash***
- ***16 Kb RAM***
- ***16 kB FRAM permanent memory***
- ***2 Serial ports RS232 (1/RS485)***
- ***1 CAN OPEN Master/Slave***
- ***4 analog-innputs 12 bit***
- ***2 Analog Outputs +/-10V***
- ***11 Digital Inputs PNP 24 Vdc***
- ***8 Digital Outputs PNP 24 VDC up to 1 A***
- ***4 Channels STEP/DIR Line Drive o Open Collector***

2 Idenification code

ORDER CODE NG Quark	
NGQ/ - - - -	
0	Without Analog Inputs or STEP/DIR Channels
A	4 – Analog Inputs 5 V
B	4 – Analog Inputs 12 V
C	4 – Analog Inputs 10 V
D	4 – Analog Inputs 4-20 Ma
E	4 – Analog Inputs 24 V
P	4 – STEP/DIR Channels Open Collector
L2	2 – STEP/DIR Channels Line Drive
L4	44 – STEP/DIR Channels Line Drive
0	SER1 RS232 - SER2 RS 232
1	SER1 RS232 - SER2 RS 485
0	Without Analog Outputs
1	2 – Analog Outputs +/- 10V
A	Default Analog Input 5 V
B	Default Analog Input 12 V
C	Default Analog Input 10 V
D	Default Analog Input 4-20 Ma
E	Default Analog Input 24 V
The **4 analog inputs** configuration excludes the default analog input	
0	Without Expansion permanent memory
1	16 Kb Expansion permanent memory

4 NGQuark Connection



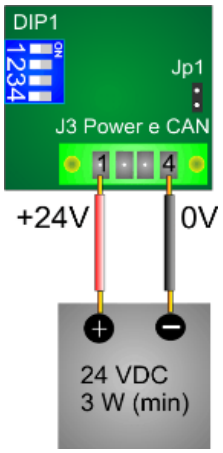
5 Connections description

5.1 Power

The NGQuark requires two separate power supplies:

- **Logical Power J3**
- **Digital Outputs Power J1 e J2**

To supply the digital outputs, see the relevant **chapter 4.7**.
As regards the supply of the logic section, this is necessary for normal operation of the card.



5.1.1 Electrical Characteristics

	U.m.		Min	Standard	Max
DC In	Vdc		12	24	35
Power (to 24Vdc)	W			2,6	

PIN	Description
1	+ 24 VDC
2	CAN L
3	CAN H
4	GND

THE SYSTEM IS PROTECTED FROM POLARITY INVERSION

WARNING
DO NOT EXCEED THE MAXIMUM VOLTAGE VALUE ADMITTED BECAUSE THE CARD CAN BE DAMAGED

5.2 Serial Ports

The serial ports on the **NGQuark** allow communication with external devices to the control, PC-type, PLC and other.

- **SER1-PRG**: is normally used both for the download of the programs on the control, both for the debugging from a PC application. It is also the port to use for updating the firmware

- **SER2**: Can be used for communication with other devices, such as a PLC, inverters or other. **CAN BE CONFIGURED RS485 MODE**.

For the electrical signal, the serial ports are in compliance with RS232/RS485.

Use a **CABLE WITH SHIELD** for serial ports connections
Connect the **SHIELD to PIN 5** SER1 or SER2 to NGQuark ports

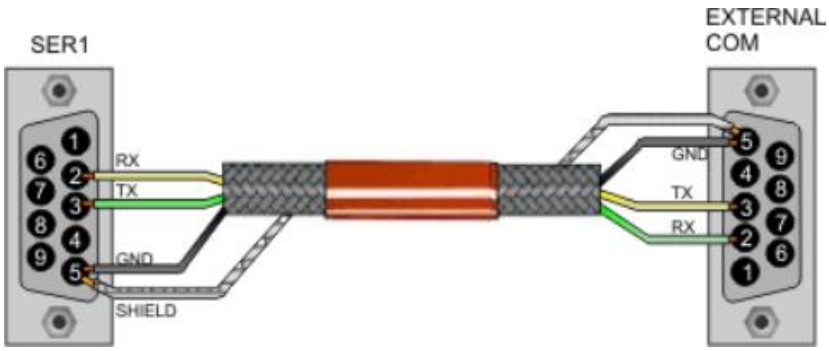
Generally the RS232 connection, uses a NULL MODEM cable (pin 2,3,5) CROSSOVER (with inversion on pin 2,3)

Always check the external device that type of connection it accepts

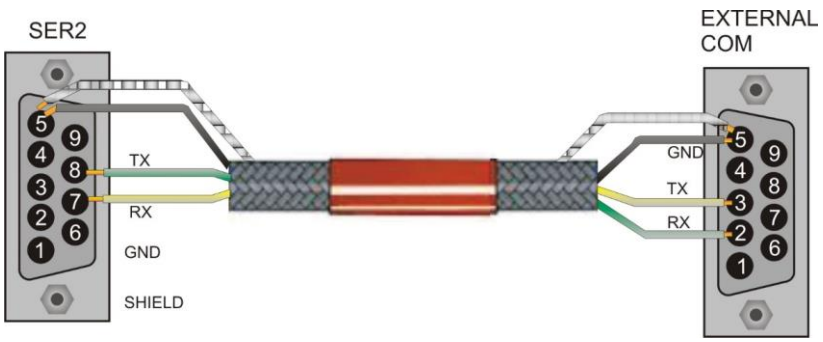
THE J6 CONNECTOR IS NOT IN STANDARD RS232 MODE

SER1 and SER2 are connect to same connector J6

SER1 in RS232 mode

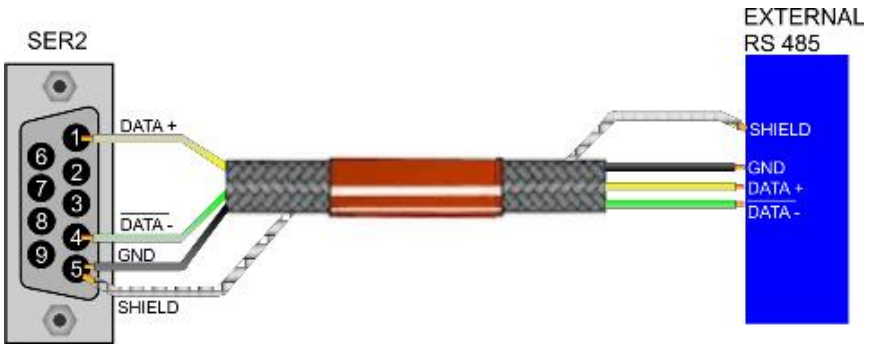


SER2 in RS232 mode

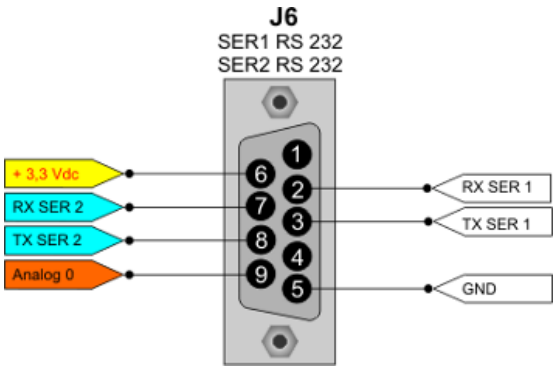


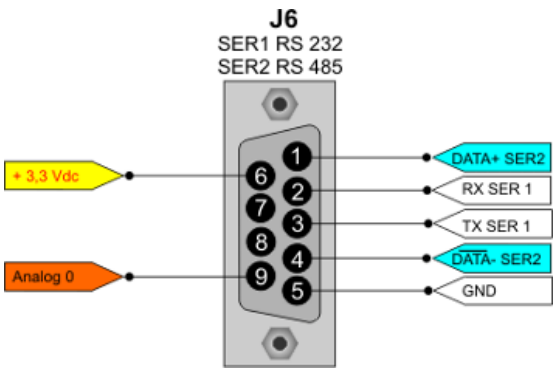
SER2 in RS485 mode

Normally the GND pin is not connect



5.2.1 J6 Connections





WARNING
THE PIN 6 +3.3 Vdc
MUST NOT BE CONNECTED
ONLY FOR FUTURE EXPANSIONS

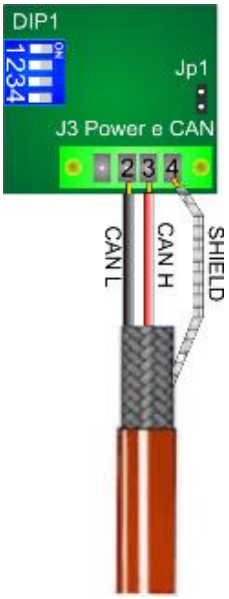
WARNING
DO NOT INSERT THE CONNECTORS PORT WHEN THE POWER IS ON
BECAUSE THE CARD CAN BE DAMAGED

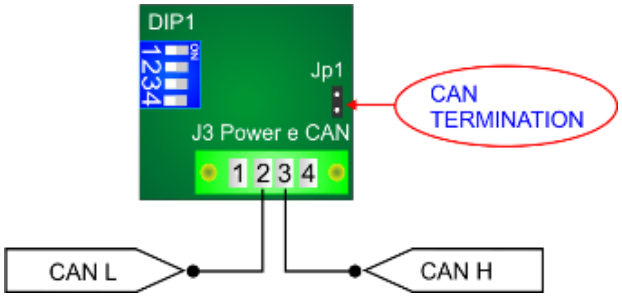
5.3 CAN BUS port

The port CAN BUS allows the communication of the card NGQUARK with type devices for motors drives, slave of various kinds, encoders, and more.
Communication takes place via the CAN OPEN protocol, based on its specifications DS401 and DS402 as regards the objects and the modes supported.
In terms of data exchange, the line complies with DS301.
The port can be configured as master or slave depending on the firmware present.
The port CAN-BUS meets the specifications of ISO 11898-24V.

5.3.1 CAN BUS Connections

If possible insert the terminator resistor with jumper JP1





5.3.2 CanOpen Max PDO Number

Normally the max PDO number managed by NGQuark Canopen system , is **10**.
It is a total for PDO Rx and PDO Tx ex:

7 → PDO Tx
3 → PDO Rx

WARNING
USE THE CABLE FOR CANOPEN COMMUNICATION

5.3.3 Set Slave Node Number

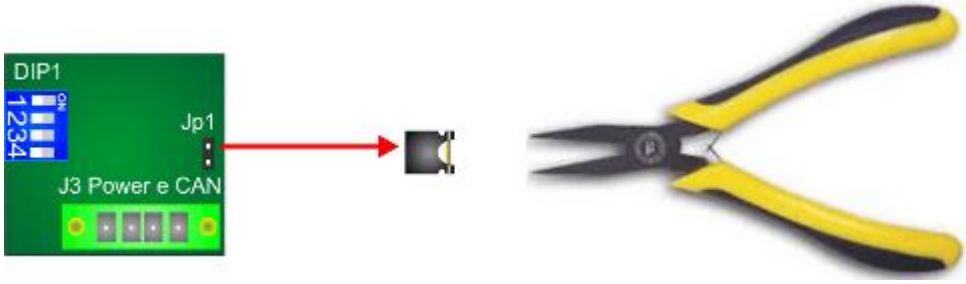
When the NGQUARK is in SLAVE MODE, you must select the CanOpen Node number by DIP 1. This is codified in binary mode (node 1 to 15)

WARNING

If the NGQuark board is configured as MASTER, insert always the TERMINATOR JUMPER

If the NGQuark is configured as SLAVE, insert the TERMINATOR JUMPER if the board is the last node in the CanBus.

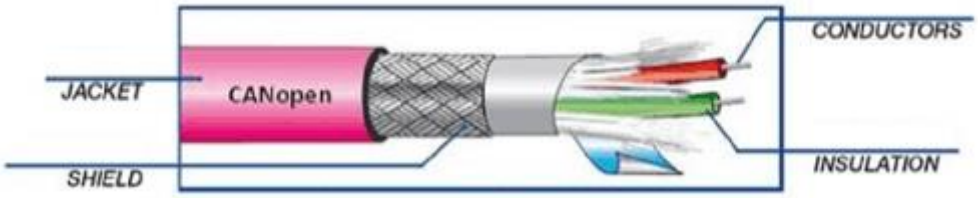
In another situations, remove the JUMPER



WARNING

USE THE CABLE FOR CANOPEN COMMUNICATION

5.3.4 CanOpen Cable



CONDUCTORS ELETTRIC RESISTANCE
22AWG: < 55,4 Ohm/Km
21AWG: < 43,6 Ohm/Km

PAIR CAPACITY
50 pF/m

IMPEDENCE
120 Ohm

TRASMISSION SPEED-CABLE LENGTH

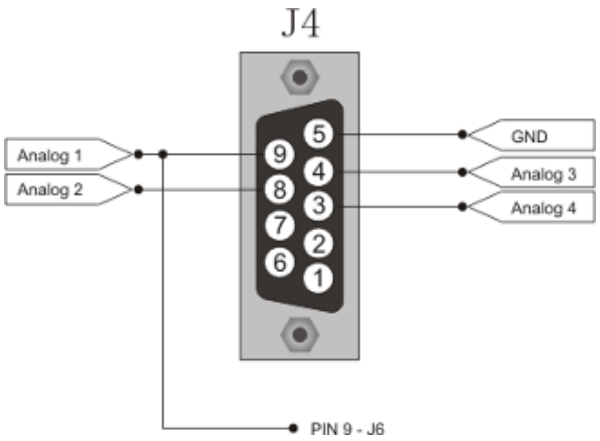
Baud rate 1Mb Length Max 25 Mt
Baud rate 800 Kb Length Max 50 Mt
Baud rate 500 Kb Length Max 100 Mt
Baud rate 250 Kb Length Max 250 Mt
Baud rate 125Kb Length Max 500 Mt

VOLTAGE EXERCISE
30 V

5.4 Analog Inputs

The analog inputs of the NGQuark can be configured to read voltage signals including 5-10-12-24 VDC, or in current between 4-20mA. Configuration is done for each input, making the system very flexible.
The input voltage can not exceed those limits by more than 0.2 V.
They can be configured up to a maximum of 4 analog inputs, one of which is always present.

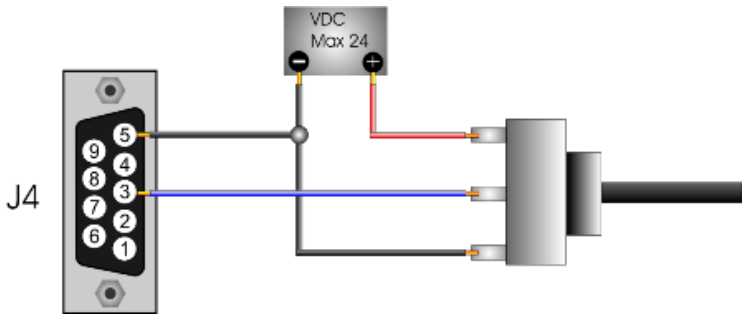
5.4.1 Analog Connections J4



5.4.2 Input Resistance

	MIN	Typical	MAX
VDC	25 KΩ		72 KΩ
4-20 Ma		175 Ω	

5.4.3 Connection Example



ATTENZIONE
DO NOT EXCEED 0,2 Volt THE MAXIMUM VALUE SELECTED
THE ANALOG INPUT, CAN BE DAMAGED

THE 2 or MORE ANALOG INPUTS CONFIGURATION ESCLUDED THE OUTPUTS SETP/DIR

5.5 PULSE/DIR Outputs

The card NGQuark can use, up to four outputs STEP / DIR for a total frequency of 125 Khz in position mode and 35 Khz in interpolation mode.
The outputs can be configured with OPEN COLLECTOR signals, 5V or LINE DRIVE.

5.5.1 OPEN-COLLECTOR Signals

POWER	**MAX 48 VDC**
LOAD	**100 Ma continuative 500 Ma peak**
V STATE ON	**MIN 0V MAX 1V**
FREQUENCY	**MAX 30 Khz**

5.5.2 LINE DRIVE Signals

OUTPUT DIFFERENTIAL	**MIN 2.2V MAX 3.3V specific TIA/EIA-422-B (RS422)***
FREQUENCY	**MAX 125 Khz in position mode – 35 Khz in interpolation mode**

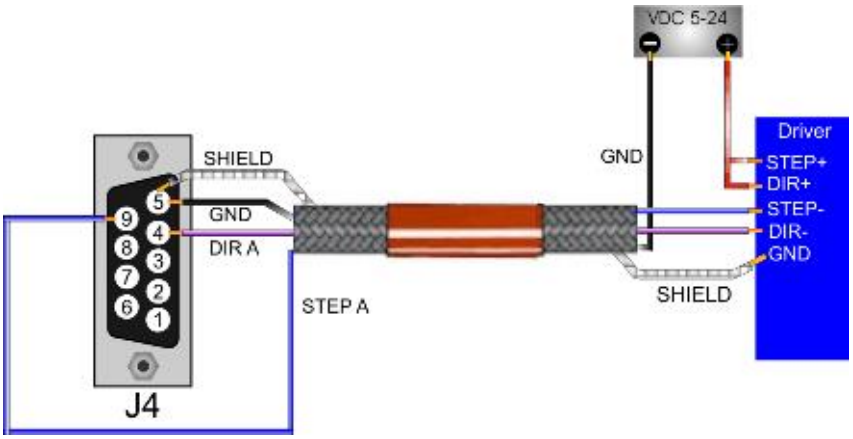
specific TIA/EIA-422-B (RS422)

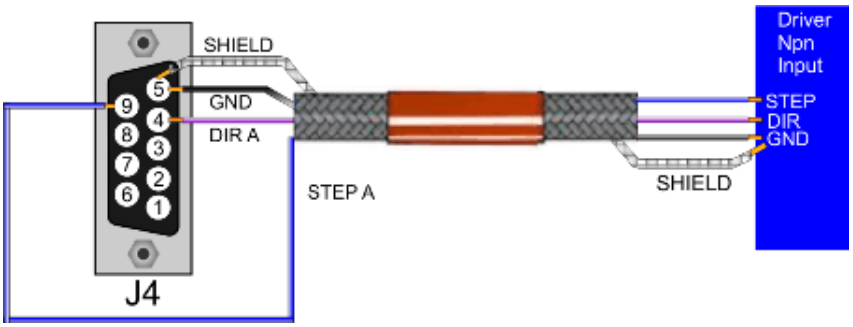
LOAD	V Min	V Typical
3,9 KΩ		3,2 V
100 Ω	2	2,6 V

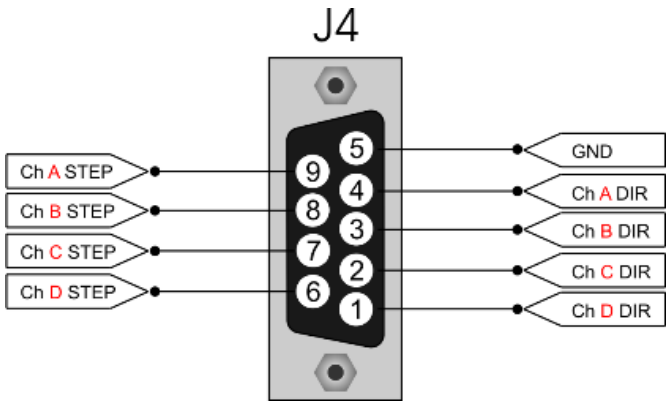
ATTENZIONE
USE A CABLE WITH SHIELD FOR THE CONNECTIONS

THE STEP/DIR OUTPUTS CONFIGURATION ESCLUDED THE 4 ANALOG INPUTS
The defualt analog input 1 is alway available

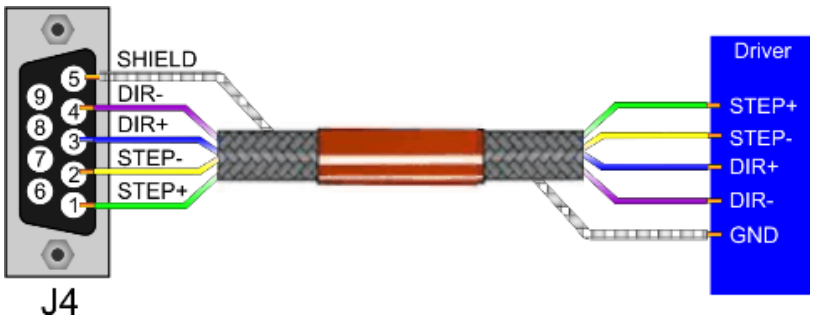
5.5.3 Connection STEP/DIR OPEN COLLECTOR J4

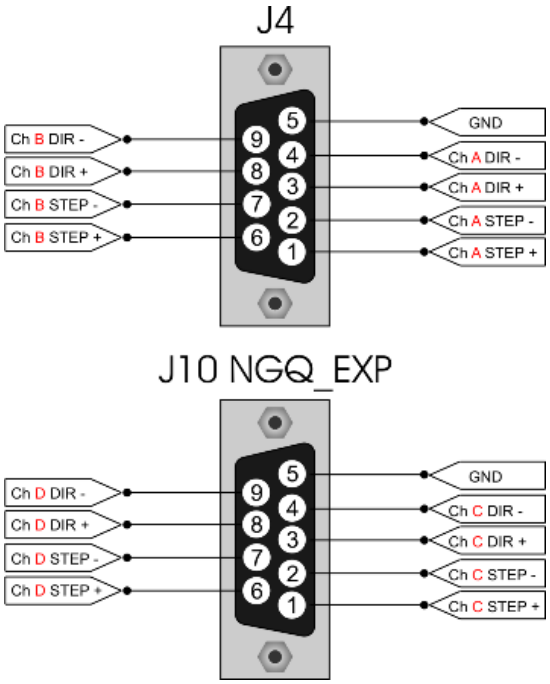






5.5.4 Connection STEP/DIR LINE DRIVE





ATTENZIONE

THE J10 CONNECTOR IS PRESENT ONLY IF USED CHANNELS LINE DRIVE 3 and 4

THIS CONNECTOR IS ON EXPANSION NGQ_EXP

USE A CABLE WITH SHIELD FOR THE CONNECTIONS

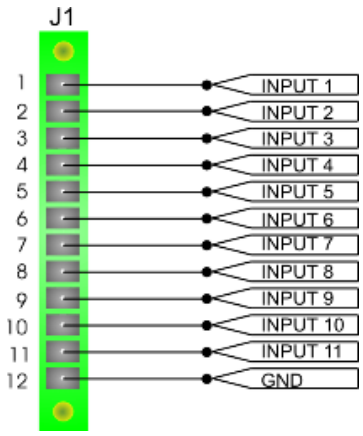
5.6 Digital Inputs

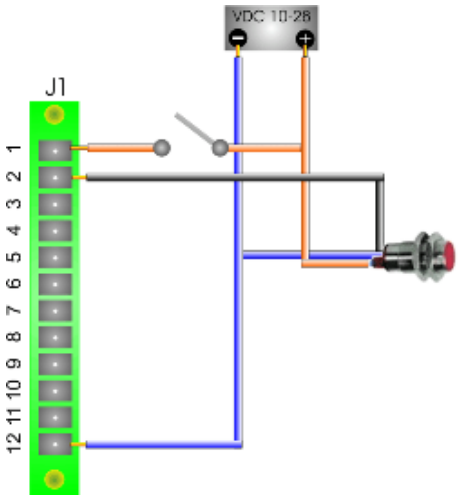
All these signals are PNP Tye optically isolated. Therefore, to enable an input must bring a positive VDC (24 Vdc typical) on the desired channel refers to the common inputs.

5.6.1 Electrical

		U.m.	Min	Standard	Max
State On		Vdc	10	24	28
State Off		Vdc	0		4
Delay	ON	ms			3 (@ 24Vdc)
	OFF	ms			2 (@ 24Vdc)
Current		mA	4 (10Vdc)		14 (@ 28Vdc)

5.6.2 Connection J1





ATTENZIONE
DO NOT EXCEED THE VOLTAGE LEVEL ABOVE DESCRIBED

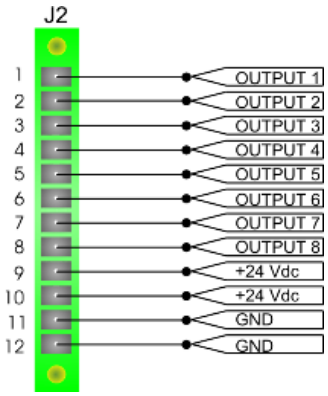
5.7 Digital Outputs

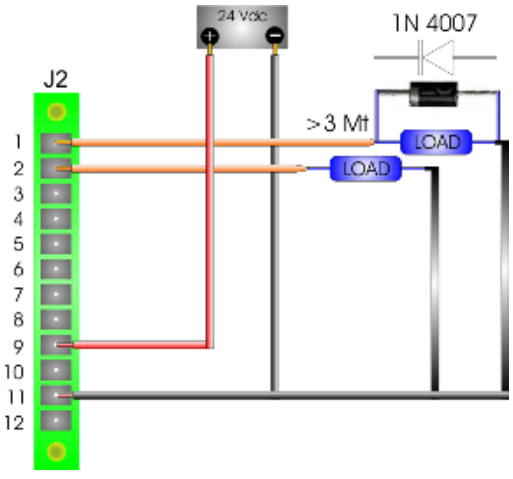
These outputs are optically isolated with respect to GND. In order to function should therefore feed them separately with a voltage of 24 Vdc. The load is driven by a transistor of the PNP type which when activated will provide a positive voltage equal to the voltage supply of the outputs.
On the card there is a protection diode so you can also directly drive inductive loads. In case of inductive loads with absorption greater than or equal to 1 A or when the cable connection between the load and board exceeds a length of 3 meters, you should put the protection diode also close to the load (diode type 1N4007 or similar).

5.7.1 Electrical

		U.m.	Min	Standard	Max	Note
Power Supply		Vdc	10	24	30	
Load		A		1		Continue (T 25°)
		A		2		Duty Cycle 25% (T 25°)
		A			6	Peak (10 ms)
Delay	ON	µs			5	
	OFF	µs			30	

5.7.2 Connection J2





ATTENZIONE
DO NOT EXCEED THE VOLTAGE LEVEL ABOVE DESCRIBED

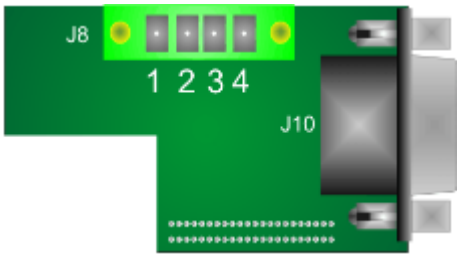
THE DIGITAL OUTPUTS, ARE NOT PROTECTED BY OVERLOAD OR SHORT CIRCUIT

5.8 Expansion Board

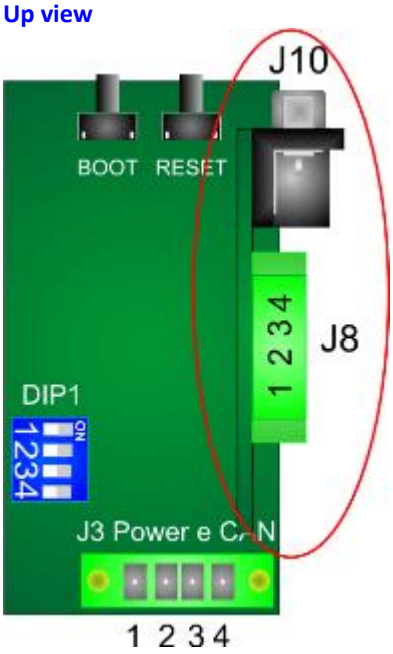
The NGQ Expansion Board contain the following features:

- ***2 Channels STEP/DIR Line Drive J10 See Chapr 4.5.4***
- ***2 Analog Outputs +/- 10 V J8***
- ***Permanent memory expansion FRAM 16 Kb***

Side view



Up view



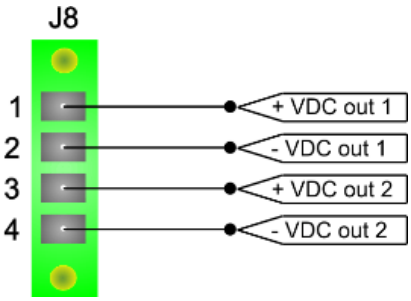
5.9 Analog Outputs

The two Analog Outputs, are on the Expansion Board in the Connector **J8**

5.9.1 Electrical

		U.m.	Min	Standard	Max
Analog Output	Output Voltage	Vdc	-10		9,995
	Output impedence	Ω	250		290

5.9.2 Analog Outputs on J8 Expansion Board



ATTENZIONE
USE A CABLE WITH SHIELD FOR THE CONNECTIONS

6 Programming

6.1 Manual Boot

The board usually uses an automatic boot.
In case, the automatic boot is not available, it is necessary to proceed in the following way:

1) Run the program NGPROG (if used VTB skip step 2 and 3)
2) Set the COM and the type of card NGQUARK
3) Load the application. SREC and press TRANSFER APPLICATION
4) Press the keys simultaneously within 15 seconds RESET AND BOOT on the board
5) Release the RESET button

6.2 Upload VTB application

For upload VTB application, is possible use the following mode:
The board NGQUARK is automatically in BOOT MODE (if is not available, see 5.1) when you use the BUTTON UPLOAD APPLICATION.
The application is automatically RUN when the transfer is finish.

6.3 NGPROG

The application was developed by Promax NGPROG to allow the update software and firmware of the new controls based on µP ColdFire.

6.3.1 Upload firmware (If not present NGQUARK select NGM13)

1) Press button **"GESTIONE FIRMWARE"** on NGProg
2) If you use **"UPDATE da File"** use the standard windows Browser for find the .SREC file
2) If you use "UPDATE da Server" you must have a intenet active connection, NGPROG search in Promax server the new version of firmware
3) Select the serial port to PC and NGM13 board type
4) Start the upload firmware

6.3.2 Upload VTB application (If not present NGQUARK select NGM13)

1) Select the NGM13 Board
2) Select the COM on PC
3) Selct the .SREC file by button **"LOAD"**
4) Start the upload by button **"TRASFERISCI APPLICAZIONE"**

7 Status Led

ST-1/L1 (Green led):

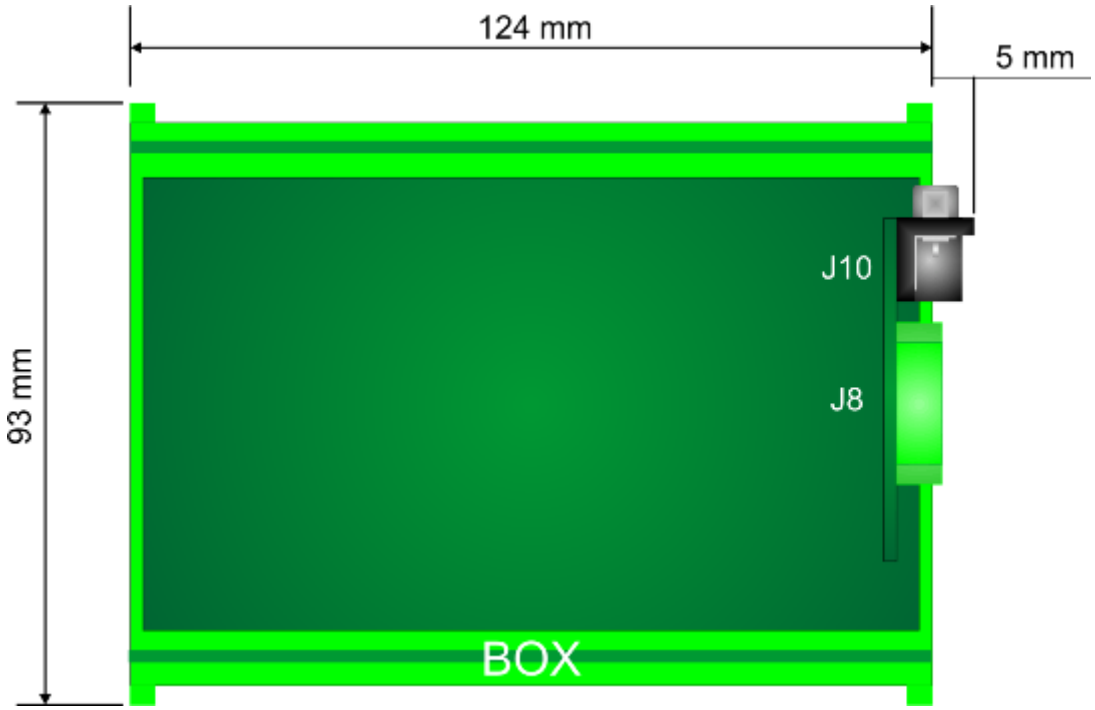
- Fast blink – board in BOOT MODE
- blink1 sec – application RUN

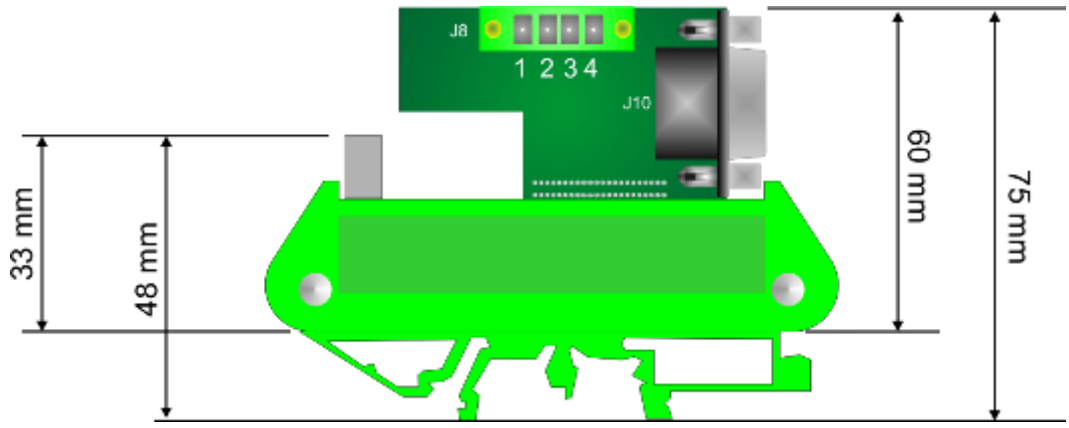
ST-2/L2 (Yellow led):

- NO BLINK - No activity on RS232 or CAN SLAVE
- BLINK - activity on RS232 or CAN SLAVE

PWR (Red led): Power On

8 Dimensions





9 Notes on the CE legislation

NGQuark complies all the legislation about CE tagging.

We have two directives about electronic devices, regarding the NGQuark : la 2006/42/CE (machine directive) about safety use of the devices and 2004/108/CE about electromagnetic compatibility.

About the first (machine directive) electric/electronic devices, must complies the "low voltage" directive (2006/95/CE) but it can be applied on devices supplied at 50-1000Vac o 75-1500Vdc. NGQUARK works at a voltage of 24Vdc (thus Intrinsically “safe”), so it belongs to "very low voltage" devices (class 0 legislation CEI 11.1), on which it isn't no legislation about.

On electromagnetic compatibility, regarding the 2004/108/CE norm, this device can be classified as a "finished appliance".Due to the fact that the NGQuark will be normally integrated inside a complex electromechanics system, the machine electric board, by a manufacturer in an industrial ambit and not by a final customer, it haven’t any certification duty.

PROMAX however, can institute some specific measure as a pre-compliance, in case of particular demands of costumers, regarding the device electromagnetic characterization.

For example, can be made some measure under the CEI EN 61000-6-1 norm (2007 generic norms – residential , commercial and light industrial ambient immunity) or CEI EN 61000-6-1 (2007 generic norms - residential , commercial and light industrial ambient emission)

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